



AGGREGATE QC/QA MSP-96-02K

1.0 Scope. This specification defines the Quality Control (QC) responsibilities of the aggregate producer and the contractor, and the Quality Assurance (QA) and acceptance responsibilities of the engineer for aggregates specified to meet QC/QA provisions.

1.1 All materials shall conform to Division 1000, Materials Details, unless otherwise noted.

1.2 Approval of a source by the engineer and implementation of a QA program by the engineer does not relieve the producer of the responsibility to insure aggregate specification compliance through all shipping and handling. Contractors are also responsible for transporting and handling aggregate in a manner which will preclude significant variation to the properties of the aggregate. The engineer reserves the right to test all aggregate at any point in the process up to and including final placement to determine acceptability for use according to contract specifications.

1.3 All Superpave bituminous aggregate production shall have a QC Plan. All other aggregate production may require a QC Plan, if specified elsewhere in the contract.

2.0 Quality Control (QC) Plan. For bituminous mixture aggregates, the aggregate producer shall submit the QC Plan through the bituminous mixture producer to the State Materials Engineer for approval. The QC Plan shall be agreed to by both the aggregate producer and the bituminous mixture producer and so noted in the accompanying cover letter. For all other aggregates requiring a QC Plan, the QC Plan shall be submitted by the aggregate producer directly to the State Materials Engineer for approval.

2.1 Aggregate shall not be produced for a project until the QC Plan is approved, except for the purposes of obtaining a bituminous job mix formula. Such material will not be approved unless it falls within the criteria established in the QC Plan.

2.2 When the QC Plan is intended for more than one fraction of aggregate, all applicable components shall be shown. The QC Plan shall include, but is not limited to:

- (a) The quarry location and the ledges within the quarry from which the aggregate will be produced.
- (b) The tests to be run and sampling frequency. Tests shall include, but are not limited to: sieve analysis, (AASHTO T 27), percent deleterious substances in coarse aggregate ([MoDOT Materials Manual, Field Section 1001.5](#) and [Field Section 1001 Annex A](#)), coarse aggregate angularity (ASTM D 5821), fine aggregate angularity (AASHTO T 304, Method A), clay content (AASHTO T 176), thin and elongated particles (ASTM D 4791), liquid limit (AASHTO T 89), plastic limit and plasticity index (AASHTO T 90), when applicable.
- (c) The method of recording and preserving test results.
- (d) A description of the sampling location and method.
- (e) The method of stockpiling aggregates at the aggregate plant as well as the final delivery site

and who (aggregate or other plant personnel) is responsible for maintaining the stockpiles.

- (f) A personnel list describing the responsibilities of all personnel involved with the QC program, including supervisors and technicians.
- (g) The gradation to be produced and allowable gradation tolerances for each sieve.
- (h) A course of action for tests not in compliance with the specifications and/or the QC Plan gradation tolerances.
- (i) A plan for resolving conflicts. The plan shall include a proposed independent third party name, address and phone number, and an approved third party laboratory for dispute resolutions. The third party shall be independent of the contractor and all project subcontractors or suppliers.

2.3 All testing for dispute resolutions shall be performed by an approved laboratory. MoDOT's Central Laboratory is AASHTO Accreditation Program (AAP) certified in the areas of Bituminous Concrete Aggregates and/or Portland Cement Concrete Aggregates and is an approved laboratory. Other approved laboratories shall be independent of the contractor and all project subcontractors or suppliers, be AAP certified in the areas of the material being tested, and have the equipment and qualified personnel to perform any required provisional test methods. A list of approved laboratories will be maintained by the Materials Division for those laboratories submitting proof of accreditation for the above stated areas.

3.0 Quality Control (QC). QC shall be performed in accordance with the QC Plan and the requirements herein.

3.1 The aggregate producer shall provide and maintain equipment and qualified personnel to perform all QC field inspection, sampling and testing as required by this specification. All producer qualified personnel shall be qualified by MoDOT required training for Aggregate QC/QA. At least two QC inspectors shall complete the training. Others may need to be trained in order to sufficiently cover the testing required. Under no circumstances will unqualified personnel be allowed to perform QC testing. Personnel qualified by MoDOT will retain a qualified status for a period not to exceed 3 years. Personnel will be disqualified if acceptable methods and procedures are not followed.

3.2 Samples of each aggregate fraction shall be taken daily for sieve analysis and percent deleterious. When an aggregate fraction daily production is less than 1500 tons (1500 Mg), a minimum of 1 sample per fraction per day shall be taken. When it exceeds 1500 tons (1500 Mg), a minimum of 2 samples per fraction per day shall be taken.

3.3 As a minimum, samples for coarse and fine aggregate angularity, clay content, thin and elongated particles, liquid limit, plastic limit and plasticity index shall be obtained every 10,000 tons (4536 kg) or fraction thereof.

3.4 All QC sample test results shall be maintained in a bound booklet format and available to the QA inspector at all times. Tests shall be completed within 24 hours on all samples obtained.

3.5 One half of each QC sample shall be identified and retained by the aggregate producer for seven days for QA testing. The retained sample shall be the remaining half of the final reduction in sample size obtained for QC testing. The retained sample's identification shall

consist of, but is not limited to:

- (a) Time and date sampled.
- (b) Product specification number.
- (c) Type of sample, i.e. belt, bin, stockpile.
- (d) Test results.
- (e) Sampler/Tester

3.6 QC Laboratory. All QC testing shall be performed in an approved Field Laboratory meeting the requirements of this specification and Sec 601, except that no direct payment will be made for providing the laboratory, equipment and services as specified above

3.6.1 The contractor shall calibrate or verify all significant test equipment associated with tests covered in this specification. Intervals as set by contractor shall not exceed the limits set as follows:

Equipment – Test Method (AASHTO)	Requirement	Interval (Month)
Mechanical Shakers – T27	Check Sieving Thoroughness	12
Sieves	Check Physical Condition	6
Weighted Foot Assembly	Check Weight	12
Mechanical Shaker – T 176	Check Rate and Length of Throw	12
Liquid Limit Device – T 89	Check Wear & Critical Dimensions	12
Grooving Tool – T 89	Check Critical Dimensions	12
Ovens	Verify Temp. Settings	4
Balances	Verify	12*
Timers	Check Accuracy	6

* Calibrate and/or verify after each move.

3.6.1.1 An inventory of all major sampling, testing, calibration and verification equipment including the serial number or other identifying number shall be maintained.

3.6.1.2 Calibration and verification records shall include but are not limited to:

- (a) Detailed results of the work performed (dimensions, mass, force, temperature, etc.)
- (b) Description of the equipment calibrated including identifying number
- (c) Date the work was performed
- (d) Identification of the individual performing the work
- (e) Identification of the calibration or verification procedure used
- (f) The previous calibration or verification date and next due date
- (g) Identification of any in-house calibration or verification device used (including identification to establish traceability of items such as standard masses, proving rings, standard thermometers, balances, etc.)

3.6.2 Proficiency samples will be required for approval of QC laboratories. Any laboratory meeting the requirements of Section 2.3 will be exempt from this requirement.

3.6.3 Test records shall be maintained to permit verification of any test report.

3.6.4 Records pertaining to testing, equipment calibration and verification, test reports, internal quality systems review, proficiency sample testing, test technician training and evaluation and personnel shall be retained in a secure location for a minimum of 3 years.

3.6.5 A current copy of all test methods and procedures shall be maintained in the QC laboratory at all times for reference by the technicians.

3.6.6 Examples of report formats and procedures may be found in AASHTO R 18.

4.0 Quality Assurance (QA). The QA inspector shall test at least 5 percent of the retained samples to assure the quality of the material. Retained samples will be chosen at random. The QA inspector will keep a written record of test results and provide both the aggregate and Superpave mixture producers access to these records.

4.1 All QA field inspection, sampling and testing will be performed by a qualified MoDOT technician. The QA Inspector shall have free access to any and all testing equipment used by the aggregate producer and any workbooks, records or control charts maintained by the aggregate producer for the QC process. The QA inspector shall also have sufficient access to the quarry grounds in order to assure compliance with the approved QC Plan.

4.2 The engineer will independently sample and test the aggregates at a minimum of every third day of production for gradation and deleterious. Other tests shall be performed at not less than the same frequency as the producer. The engineer's test results, including all raw data, will be made available to the producer upon completion of the test.

4.3 Comparison for aggregate shall be considered favorable when the test results of the engineer's independent sample meet specifications and when the contractor's QC test results and the engineer's QA test results of a retained sample compare within the following limits.

4.3.1 Gradations:

Sieve Size	Percentage Points
3/4 inch (19 mm) and larger	5.0
1/2 inch (12.5 mm)	5.0
3/8 inch (9.5 mm)	4.0
No. 4 (4.75 mm)	4.0
No. 8 (2.36 mm)	3.0
No. 10 (2.00 mm)	3.0
No. 16 (1.18 mm)	3.0
No. 20 (850 µm)	3.0
No. 30 (600 µm)	3.0
No. 40 (425 µm)	2.0
No. 50 (300 µm)	2.0
No. 100 (150 µm)	2.0
No. 200 (75 µm)	1.0

4.3.2 Coarse Aggregate Angularity. Angular particles shall be within 5 percentage points.

4.3.3 Fine Aggregate Angularity. Void content shall be within 2 percentage points.

4.3.4 Clay Content. Sand equivalency shall be within 5 percentage points.

4.3.5 Thin and Elongated Particles. Flat, elongated particle content shall be within 1 percentage point.

4.3.6 Deleterious. The total deleterious content shall be within 2.0 percentage points.

4.3.7 Plasticity Index. The plasticity index shall be within 2. No tolerance shall be allowed for material when it is specified to be non-plastic.

4.4 Performance and acceptance of QC/QA testing for this contract does not eliminate any requirements that may be necessary as FHWA requirements for acceptance of the materials.